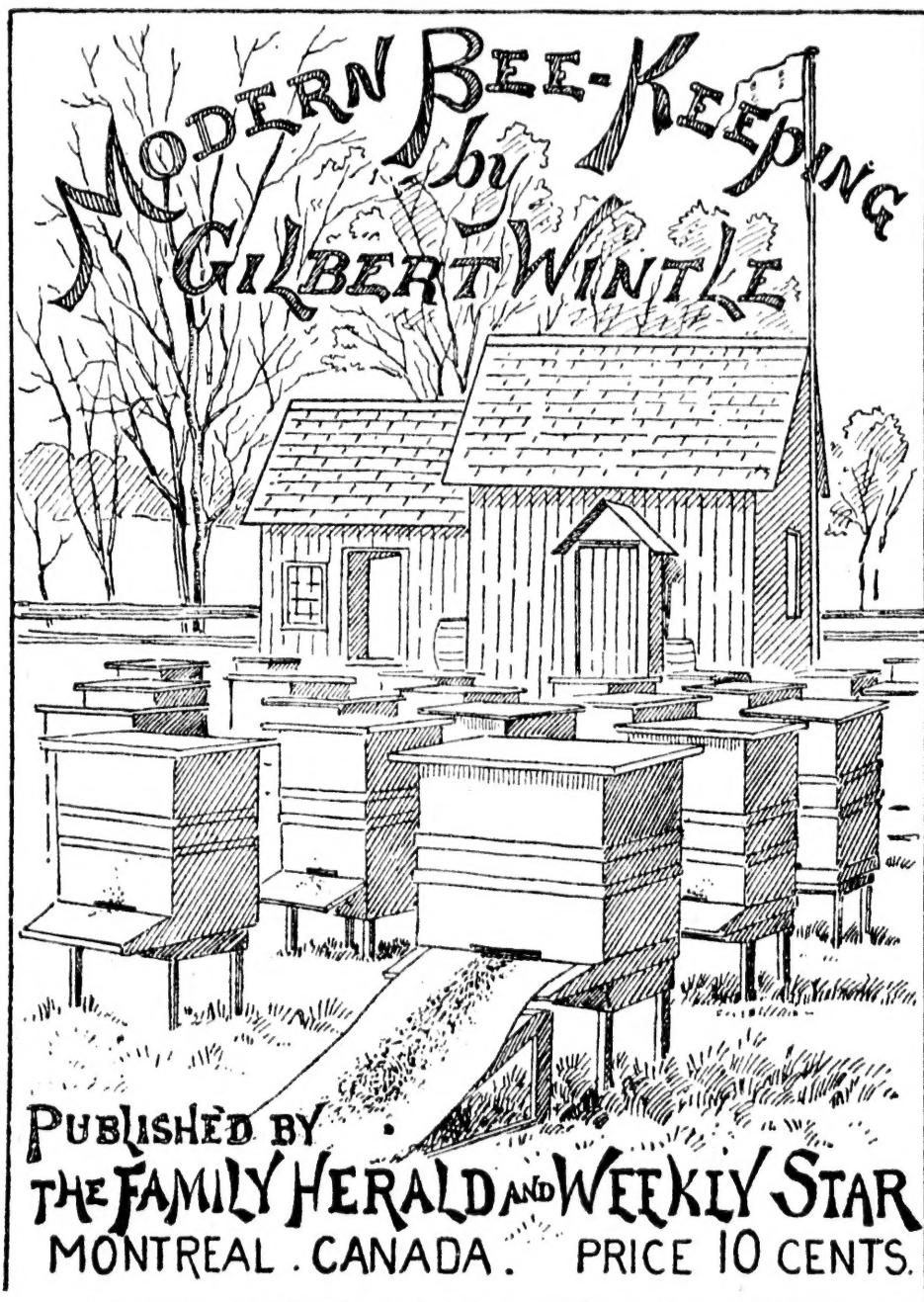


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PUBLISHED BY
THE FAMILY HERALD AND WEEKLY STAR
MONTREAL . CANADA . PRICE 10 CENTS.

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FAMILY HERALD AND WEEKLY STAR
MONTREAL, QUE.



Modern Bee-Keeping

BY GILBERT WINTLE.

REPRINTED FROM
THE FAMILY HERALD AND WEEKLY STAR
1899.

PUBLISHED BY
THE FAMILY HERALD PUBLISHING COMPANY,
MONTREAL, CANADA.

PRICE TEN CENTS.

This is not a bee-keeper's hand book. It is not even an amateur bee-keeper's hand book. But, in a modest way, it is an attempt to explain to outsiders something about what is certainly a most interesting, and, if systematically and properly pursued, a very remunerative country industry.

MODERN BEE-KEEPING.

CHAPTER I.

THE LIFE CYCLE OF A BEE COMMUNITY.

In thinking or speaking about bees (by which I mean hive bees, as these are the only kind which we shall here consider) the first point to grasp is that, except indeed in the case of the queen, the solitary bee is nothing. One worker bee alone cannot build comb, cannot reproduce its species, may cannot even keep itself alive through a moderately cold night. Only as a member of a community, that is to say a hive, or as the professional bee-keeper generally calls it, a stock, is it able to take its share in comb-building, honey gathering and storing, and the rearing of the young; and even then a worker bee that is born in May or June will have worked itself out and died before seven weeks have passed, so that it will never see the result of its own labours; but the community lives on and profits by them. I propose to follow a bee-community through one complete life cycle; that is to say from the time when it issues forth as a swarm from the parent hive, until, having safely passed the winter, it is ready next year to send out swarms itself. And if we trace this first on the supposition that the bees are left to their own devices, are wild in fact, we shall later be better able to appreciate the scientifically constructed hives, and skilful manipulation, the use and practice of which constitute modern bee-keeping.

Most of us have seen bees swarming. We know how they come boiling out of the hive, flying round and round, making that peculiar excited buzzing, so well known to the bee-keeper as the swarming note, until the effect is that of a dark cloud of eddying and (apparently) furious insects. People are apt to have such curiously variant ideas about the number of bees in a swarm or in a hive, that it may be well to state before going on that the number of bees in this cloud is generally somewhere about twenty thousand, and that probably as many more have stayed behind to carry on work in the parent hive. Twenty thousand does certainly seem a great many; but if anyone who has seen a swarm will remember how the air through quite a large space was literally black with bees, and will then reflect how small an insect a bee is, I think that he

will cease to wonder at the figure. Gradually this cloud of insects moves as a whole in the direction of some convenient tree or bush, generally quite close to the hive, say twenty yards from it. And now the cloud seems to be getting thinner, and a careful inspection will show that a cluster of bees is being formed on one of the branches. This cluster rapidly increases in size, until it has absorbed nearly all the bees in the air, by which time it resembles, if I may be allowed a homely simile, nothing so much as a big black jelly bag. At this point, presumably, the bee-keeper has come up and hived the swarm and we have seen no more of it; but in the case we are following we will suppose that no bee-keeper comes to interfere.

Though most of the swarm are in the cluster, a few, some hundreds perhaps, are now away scouting, searching, that is to say, for a suitable place for the new home. Occasionally a few of these scouts come in and join the cluster, having apparently been unsuccessful and given it up. At last, however, all in a body, as if they were indulging in a miniature swarm on their own account, the successful scouts return; the cluster melts away, and, with the scouts leading, the whole swarm starts off for the place they have found. Nine times out of ten this will be a hollow tree. The first care of the bees, after taking possession of their new quarters, is to see that the queen is safe. The queen is the only perfect female in the community, that is to say, she is the only bee that can lay eggs and reproduce the species, so if anything has happened to her, the whole swarming has been a failure, and there is nothing else for the bees to do but go ignominiously back to the parent hive and ask to be taken in again. As soon as the bees have reassured themselves of Her Majesty's safety, the workers begin their first serious task, the building of comb. It is the more important, that no time should be lost in setting to work at this, as, since the queen lays her eggs in the cells of the comb, till this is ready she must remain idle.

Before leaving the parent hive, each worker, like a prudent adventurer, filled up

her honey sac (which constitutes a considerable part of a bee's anatomy) with honey, on the principle, I suppose, that as she had helped to gather it, she might fairly take some of it away; so the new community is ready to start comb building with honey brought from the parent hive. But comb, you may say, is not made of honey, but of wax. Exactly, but wax is made of honey, that is to say, the bee eats the honey and then secretes the wax by a gland. The process is as follows: The bees suspend themselves in long festoons from the roof, when every worker is in place, perfect stillness is kept, the temperature rises, and gradually on the under side of each bee appear little globules of liquid wax, which soon harden into little flakes or scales. Then one of the bees near the top takes a scale from her body, chews it to make it plastic, and attaches it to the top of the hive; another follows, and soon, bee by bee, each one adding a little here, or thinning off there, the comb begins to assume definite shape. It is not necessary for the bees all to hang together like this to produce wax; but the stillness and high temperature favour its secretion, and in an empty hive, when a comb is wanted at once, this is how they always proceed.

And now the hive settles down to ordinary routine. The queen lays eggs, and so many does she lay, and so constantly does she keep to this duty that a dozen or so of worker bees have to attend on her, feeding her, and cleaning out the cells in which she is to lay. The duties of workers are indeed many and varied. A few are posted as guards or sentinels at the entrance, and any marauding bee or wasp is stopped, and perhaps stung, by them if he should try to enter. Other workers, their number varying according to the temperature, do duty as what are called fanners, and with their wings keep up a constant circulation of air through the whole hive; and so well do they do their work that on a hot day a lighted match held in front of the hive entrance is almost blown out. A much larger proportion of worker bees are engaged in making the home tight and weatherproof. These little masons, or rather plasterers, get from the trees a kind of gummy substance, called propolis, with which they proceed to fill up every crack or cranny that might let in the rain. Sometimes they mix the propolis with wax.

But the main body of the workers are neither queen attendants, nor sentinels, nor fanners, nor plasterers, but foragers. All through the day they are going and coming, sallying forth, brisk and slim, and returning, flying slowly, with distended honey sac, and perhaps legs packed with pollen

as well, to deposit their plunder in the comb, and then set out for more. The expression "legs packed with pollen" requires explanation. The hind legs of a worker bee are provided with hairs, which in conjunction with the bee's thigh form a kind of basket; and when she visits a flower, after she has filled her honey sac with nectar, if there is any pollen she packs it into these.

Thus a bee well loaded with pollen appears to drag after her two little yellow balls. So prominent are these that one classical writer evolved, and immortalized in verse, the idea that these were two pebbles, which the intelligent insect carried to balance herself with in high winds! The pollen, like honey, is for food. But though full-fledged bees do eat pollen, its chief use is for making into paste with honey, which is fed to the grubs.

On the fourth day these young grubs will be hatching out, and from now on there will be another duty for the worker bees to perform—that of nurses. Just at first the nurse bees feed the grubs with a sort of pap which they secrete—one might almost call it milk, if it did not sound absurd to talk of bee milk; but the grubs are not given much of this, and soon have to be content with the above mentioned paste of pollen and honey. As the gland which produces the pap tends to atrophy and dry up when the bee is about three weeks old this duty of nurses is generally undertaken by the youngest among the workers. After about six days' nursing the grub will be full grown, and the nurses seal him up in his cell with a little cap made of wax mixed up with pollen, and finally, just three weeks from the time the queen laid the egg, what has been sealed up as a grub eats its way out, a perfect bee. And now that the younger generation has appeared to reinforce the remnant of the original twenty thousand, all should go well. More combs will be built, breeding will go on faster, and large stores of honey will be laid up for winter.

So far the only kind of bees that I have mentioned have been the queen bee and the workers, and, as no doubt the reader has noticed, I have called them both "she." And both are female, really, but in the worker the ovipositing and other sexual organs are in so rudimentary a condition, that for all practical purposes the workers are neither male nor female, but neuter. The queen, on the contrary, is, as we have seen, the mother of every bee in the colony. But besides queens and workers, there is a third kind of bee, the drones or males. These latter do no work, and, as soon as the honey flow shows signs of slackening

in autumn, the workers drive them from the hive to die. As the honey flow lessens still more, fewer bees go out as foragers, and more work as plasterers, until, at the approach of winter, they are practically all gathering propolis, and painting it over the inside of their home, and this goes on till the weather becomes too cold for them to venture outside the hive. By this time the queen, too, has stopped laying.

There is not much to say about the bees in winter. Clustered together amongst the combs, aiding each other to keep warm, they are not exactly dormant, for every now and then, by which must be understood every few days, they have to take food, and it is when they leave the cluster in search of this that they are most in danger of freezing to death. When Spring comes, work begins again, especially for the queen, who must lay her hardest, since the bees that have gone through the winter will not last long, and need to be replaced. In fact to such an extent is breeding now carried on that soon the hive is too full. Then nature decrees that the queen, and perhaps half the bees, should feel the swarming fever; and some fine day they go off and start a new home elsewhere.

And the parent hive, whose fortunes we have been following, left now without a queen, will it not die out? No, for the bees themselves will provide a new queen, and this is how they will do it. They choose some cell, in which the queen who has deserted them has just laid an egg, and, with great care not to injure the egg, they enlarge the cell, until it is about three times its former size. It is now what is known as a queen cell. When the little grub hatches out, the nurses, instead of feeding it only for a day or two on the pap secretion, and then weaning it on to a paste of pollen and honey, as they would do to an ordinary grub, feed it on the pap secretion altogether. What with the stimulative powers of this mysterious food, and the extra room for development given by the enlarged cell, the bee, which finally emerges, is a perfect queen. Next year this new queen will go with a swarm, and the bees will have to raise another, that the community may live on; and so on each year. Thus you see, although there is only one queen bee in each hive, yet, so long as there is an unhatched egg, or even a very young grub, in the hive, they can always re-queen themselves if they lose her.

CHAPTER II.

THE HISTORY OF BEE-KEEPING.

We have now traced, albeit in the crudest outline, the life cycle of a bee community under natural conditions, that is to say under bee management. Now we will look at the matter from the bee-keeper's point of view, beginning with a glance at the history of bee-keeping.

In pre-historic times, when all men were hunters, they probably obtained honey by bee-hunting. If they did not think of it themselves, the bears were there to show them the way. But when men began to settle down, and to till the ground, and cultivate crops, they must surely have hit on some simpler method of getting their honey than the clumsy one of hunting for bee-trees in the forest. I say "must have" because in those days, when sugar was unknown, honey, which we now look on as somewhat of a luxury, was the only sweetener, and consequently almost a necessity. At any rate the records at Thebes show that the ancient Egyptian was a bee-keeper, and one too who went into the business on a pretty extensive scale. He used to load up great flat-bottomed boats with

hives of bees, and float them down the Nile, timing to reach each point a little after the overflow of the river had subsided, when the whole valley would be bursting into blossom. I may add that the same sort of floating apiary is used on the Nile to this day, and is also used, though less extensively, on the Danube. Some years ago the same thing was tried on the Mississippi, where, however, it was not a success; but of course the conditions of the Nile and its valley are unique. Bees were kept by the Greeks and by the Romans; and it is interesting to note that Mount Hymettus, which was celebrated for its honey in the days of Homer, is equally celebrated for it to-day. Beyond the fact that it was pretty commonly practised, I do not think that we know very much about the Greek or Roman bee-keeping. Virgil certainly writes about bees, but he writes of them in their wild state; besides which his treatment of the subject is—well, poetical, that is to say it does more honour to his imagination than to his accuracy.

In India we get on surer ground. Bees have been kept in nearly every part of India since remote ages, and very generally the same system prevails. This consists in having for a hive a long shallow box, sometimes an earthenware cylinder is used, like a drain-pipe with the ends closed. The swarm is introduced through a door at the back, which is then closed, the entrance for the bees' use being a small hole in the front end. The first combs, it is found, will then be built near this entrance, that is to say in the forepart of the hive, and to a great extent the queen will always confine her egg laying to the forepart of the hive also. The pollen, too, being wanted for the grubs, will be stored in the forepart, thus leaving all the back combs for the storage of pure honey. When the bee-keeper comes to gather his harvest he opens the door at the back and blows in smoke. This frightens the bees into the front part of the hive, while their master cuts out the combs of honey at the back. Then he shuts up the hive again, and the bees, whose breeding arrangements it will be observed have not been disturbed, set to work with redoubled energy to build more combs and gather more stores, which in due time the bee-keeper will take as he did the first.

And now from bee-keeping in India let us turn to bee-keeping as it was practised in England and Canada, or for the matter of that throughout Europe and America too, at the beginning of the present century. The bee-keeper (it almost makes one blush to tell about it) used to get a swarm of bees, put them in a straw hive, and leave them to their own devices. In the autumn, having previously decided what bees he meant to "take," as he called it, he proceeded to do so, by the simple expedient of sulphuring them to death! For his trouble he generally got some fifty pounds or so of dark-looking, sulphur-smelling honey, mixed up with eggs, pollen, dead bees, and dead grubs, and, if he were very lucky, perhaps two or three combs of white virgin honey fit to put on the table. The first advance on this system, if system it can be called, was to put the swarm into a very small hive, and then, when it was judged that the bees had filled it, to give extra space by adding two more hives, communicating with it, one on each side, and sometimes a third on top as well. The queen generally confined her egg-laying to the centre hive, so that when the bee-keeper took away the extra hives, or honey-boxes as they were called, in autumn, he found them full of pure white honey; he also saved his bees to work for him another year. This of course was a

great stride in the right direction, but for all that it was little more than had been done in India for centuries. This is how we should be keeping our bees to-day, but for one man, Mr. Langstroth, who in 1852 invented the movable frame hive, the main feature of which has never been improved on, and which, it is not too much to say, has revolutionized bee-keeping throughout two continents. By the way, to give honour where honour is due, it should be stated that Mr. Langstroth was an American. Like all great inventions, his is quite simple—when you know.

For some time various experimenters had aimed at making a hive, in which the combs should be readily movable at the will of the bee-keeper. Huber had indeed achieved this, in his leaf hive, as it was called; but his hive, though very useful to the naturalist, was altogether too complicated and expensive for use in a practical apiary, where the bee-keeper's object is not science but prosaic dollars and cents. Suggested probably by Huber's hive was the bar hive. This was a square wooden box with a moveable top, directly under which was a row of loose horizontal bars or slats, the ends of which rested on lodges, nailed along two opposite sides about an inch from the top. The under sides of these bars were coated with beeswax, the idea being the bees would thereby be induced to build one comb on each bar, then, since combs are always built hanging straight down, it was argued that all you would have to do to move a comb would be to lift the bar on which it was built, and the comb would come too. It was found that the bees quite understood the hint given by the wax on the under sides of the bars, and, as far as getting good straight combs went, this hive was really quite successful. But straight combs, however nice they may look, cannot obviously be manipulated unless they are also moveable; and in this respect the bar hive was a failure. For it was found that the bees, not content with attaching their comb to the movable bar at the top, generally built strong attachments to the sides of the hive as well. So the bar hive idea, though very ingenious, fell through. Then came Mr. Langstroth. He built a light wooden frame, a little smaller than the inside of the hive, on each bar. Then the bees built their top attachments to the bar and their side attachments to the sides of the frame, and a perfectly movable comb was the result. This was the genesis of the bar-frame hive, in use by every practical apiarist to-day.

However, one more invention had to

some before modern bee-keeping could be said to be fairly inaugurated. This was what was known as comb-foundation. This time the credit lies with Germany. As the idea of the ear frame sprang from the bar, so the idea of comb-foundation may be assumed to have sprung from the comb-guide, that is the coating of beeswax that was put on the underside of each bar. If the bees would accept this as a guide for placing their comb, why should it not be practicable to hang a thin sheet of beeswax in the frame, for the bees to work up, or draw out, as it is technically termed? At first sight it does not seem as if there would be very much advantage in this. Practically there are often times, as we shall see when we come to study the working of an apiary, when it is a great object to help the bees over their work of comb-building; then, too, there are many minor points, such as getting the comb firmly built out to the sides and bottom of the frame, which, though not easy to explain on paper, are soon appreciated by any one whose work lies amongst bees. As a matter of fact it was found that, if the sheet of beeswax was plain, the bees would not accept it. They might use perhaps the top three quarters of an inch; but after that, rather than bother with it, they would bite it away, and make their own comb altogether.

At this point the idea occurred to Herr Mehring, an ingenious German bee-man, to try stamping the wax with an hexagonal pattern, of the proper size for marking the bases of the cells of the honey-comb. This was in 1857. The stamp sheet was accepted eagerly by the bees, and to-day comb-foundation made after this method is the practical bee-keeper's standby all over the world. Indeed Herr Mehring builded better than he knew. Not only does his invention enable us to help the bees with their comb construction at critical times, and to insure a neater result of their labours; but, by letting very thin platinum-silver wires into our sheet of wax, we get a comb so strong that it will stand the whirl round in the extractor, a machine which throws the honey out by centrifugal force, leaving the comb intact, to be returned to the bees for refilling. But where the up-to-date apiarist finds comb-foundations most valuable is in the broodnest, as the part of a modern hive where the queen lays her eggs is called; and this for a reason that the first experimenters with plain sheets can hardly have foreseen. As drone comb-comb, that is, the cells of which are fit

for the rearing of drone grubs—is of a different pattern from worker comb, it will be at once seen that, by the employment of this stamped foundation, the bee-keeper can control the proportion of drones in his hives. Either for honey production or breeding, the advantages to be derived from a judicious exercise of the power thus given are very great.

At this point I wish to make a digression, to remind the reader that this foundation that we are speaking of is not in any sense an artificial comb, nor is anything but the purest beeswax used in the making of it. In fact nothing else but pure beeswax will answer, it having been found by experiment that even the smallest adulteration, either with vegetable wax or paraffine, though the bees will work it up, produces a comb that, on the first hot day, will sag all out of shape, and often melt down altogether, to the destruction of the brood, if not of bees and queens as well. To show also how little it deserves the appellation of artificial comb, I may say that, though the thickness varies, the thickest kind that is made runs more than ten sheets to the inch. However, though the sheet is nothing but pure beeswax, and, in the process of being drawn out into comb, is so thinned by the bees that the bases of the cells are hardly, if at all, thicker than when the whole thing is made by the bees ab initio, it is a fact that sometimes there is a slight toughness in comb thus produced, traceable probably to the wax sheets having been worked and stamped by machinery. For this reason a few apiarists, myself amongst the number, prefer not to use foundation for honey that is to be sold in the comb.

The only other invention to which I need now draw your attention is the section honey box. This is the little wooden square that one is accustomed to buy full of honey at the grocer's. It is far from an ideal package, either from the bees' or the bee-keeper's point of view. It has to be quite filled up with comb, or it does not look nice; yet sometimes the bees take longer messing about over the last square inch in one corner of it than over all the rest. At least twenty-five per cent. more honey can be got in large combs than in these little boxes. Unfortunately, the customer demands a package of about one lb. weight; and, as big combs can neither be packed with safety nor cut in the shop without mess, for the bee-keeper who makes a speciality of comb honey, the section honey box seems to have come to stay.

CHAPTER III.

THE APIARY.

So much for the appliances of modern scientific apiculture. Now for their use, to learn which, if the reader pleases, we will together go through an imaginary year's work in the apiary.

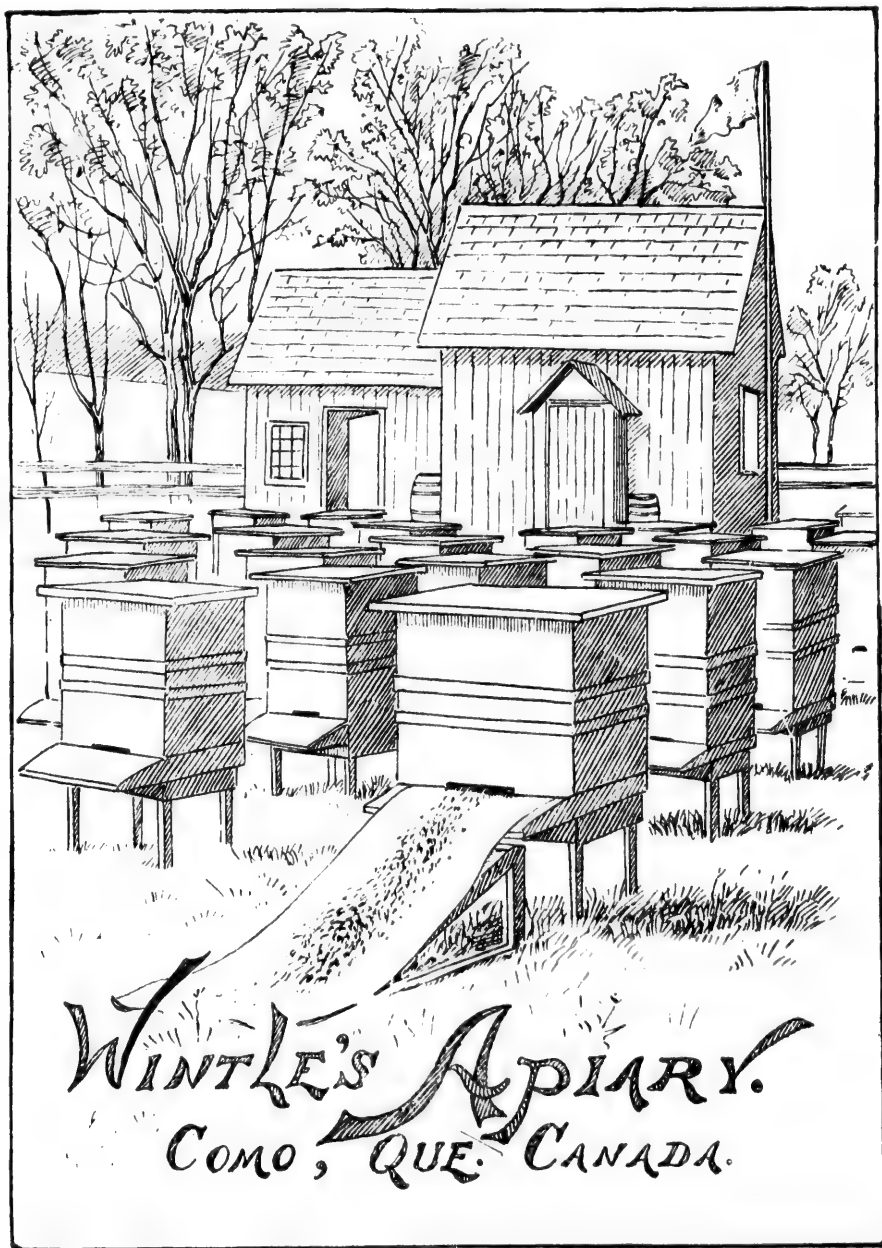
It is Spring; the bees are just awakening from their long winter's rest, and they, as also the bee-keeper and his staff, are soon going to be busy. Let us come out and look at the hives. And since I must describe someone's apiary, I hope I shall not be thought unduly egotistical if I choose the one I know most about, that is my own.

Like many apiarists on a large scale, I prefer to design and make my own hives, and to begin at the beginning, I had better explain that the man who starts to design a hive must keep constantly before his mind the fact that there are not one, but three, ideal hives. Or, stated more simply, there are three different points of view from which a hive has to be considered. First there is the bees' point of view; the hive must be comfortable for the bees, and must be arranged to work with, not against, their instincts. Secondly, there is the bee-keeper's point of view; the hive and combs must be easy of manipulation, and there must be arrangements whereby he can influence his bees to exert their honey-gathering powers to the utmost; if possible, too, he should be able to a certain extent to control the swarming impulse. Thirdly, there pocket-book; the hive must not be too expensive. The best hive is that which represents the best working compromise between these conflicting interests.

My hives, rectangular boxes, with projecting lids, and a board in front for the bees to alight on, have each a separate stand, like a four-legged stool. Probably the first thing that would strike a stranger, whose only idea of a hive was a farmer's box hive or a straw skep, is their size; he would think that they were altogether too large. But on opening one we shall find that this big hive is only an outer case. Reposing at the bottom we shall see an oblong, rather shallow, box, which is the brood-nest, or bee's part, of the inner hive; but when I say we shall see it, I am supposing that we have first lifted off a big chaff-stuffed cushion, which goes on top of it to cosy the bees in winter. The space

between the walls of the brood nests and the walls of the outer hive is also chaff-packed, with a kind of tunnel arranged through it in front for the bees' entrance. The inside dimensions of the brood-nest box are eighteen inches long, thirteen inches wide, and ten inches high; and along the two longer sides are the ledges or rabbets, edged with metal, on which rest the upper bars of thirteen frames, each frame containing its comb; on top of the frames is a close-fitting sheet of canvas, then the cushion. The reason for this sheet of canvas, as well as for the metal edge to the rabbets, is that bane of the bee-keeper, propolis.

Probably there is no subject on which bees and bee-keepers' views are so much at variance as this of propolis, or, as it is sometimes called, bee-blue. We understand how necessary, how vital even, it is to them in their hollow tree, and are lost in admiration at the industry and skill with which they gather and use it; but we cordially wish that they could be taught to do without it under domestication. To an outsider this may seem a small matter; but a bee-keeper who has much handling of frames to do, knows otherwise. However, since, in the present state of our knowledge, we cannot hope to stop propolization altogether, we try to arrange our hives so that the moveable parts shall suffer from it as little as possible. Thus the quilt or sheet of canvas, though propolized down to the tops of the bars, can be peeled off by one corner; whereas, if a board were used under the cushion, it would be almost impossible to detach it when necessary to lift a frame. Then the metal strips along the rabbets give less scope for propolization, both because the bearing surface is smaller, and because bees seem to have a dislike to propolizing metal, perhaps because of its coldness. So far we have seen, as contents of the large outer hive, a brood-nest box, containing frames, combs, and (of course) bees, covered by a quilt of canvas, and over that by a big cushion. Yet, cushion and all, it does not come more than half way up to the height of the outer hive. It is this empty space which will later on be utilized for section crates, second stories, etc., for the honey crop. But at



present all this spare furniture is stowed away in the loft of the workshop. How much of it we shall want when clover comes in great measure depends on how we do our work in spring.

First and foremost we must satisfy ourselves that each hive has a queen alive. Quickly and methodically, for when hives are numbered by the hundred there is not much time to spare in a working day, we go around the apiary. You, reader, we will imagine, lift off the cover of the hive and the cushion, and I lift a corner of the quilt, and blow in a little smoke from my smoker, a kind of small bellows and fire-box machine, which burns punk, brown paper or old rags, and which is the bee-keeper's most useful tool. The smoke frightens the bees it does not stupefy them) and, peeling off the rest of the quilt, I am generally able to lift out the centre frame without a sting. Mind, reader, I am not saying that you would be able to do so; in fact, if you should ever try a little amateur bee-keeping on your own account, I strongly advise you not to despise gloves and veil till you get confidence and know the ropes; but, except a veil, which some bee-men always keep handy in their pockets, ready to don when about to manipulate any exceptionally vicious stock, the professional apiarist will never be bothered with any more elaborate bee-dress than his shirt-sleeves. However, to continue.

The reason I have lifted the centre frame is because this is the warmest place in the hive, and therefore the spot chosen by the queen to lay her first eggs in spring. Sometimes we see her at once, stalking about majestically on the frame, surrounded by her attendants. But if not, we are quite content if we see eggs or young brood, since these could not be there if the queen were not alive and well. So I replace the frame and quilt, and you the cushion and cover, for heat is vital to brood-rearing, and the less hives are open at this season the better. Then, while you are making this one snug again, getting ready the next, I inscribe in my hive register, on the page devoted to Hive No. 1 and against the date of the day of our inspection "Q. ok." which is bee-keepers' abbreviation for "Queen all correct" also anything that has struck me in regard to the general state of the hive, such as "plenty of stores," "short of stores," "much brood," or whatever it may be. So on with the next, and the next, and the next. But (we will say) at Hive No. 5 we meet with a different

state of things. No queen, no eggs, no brood to be seen on the centre frame. I lean it quietly, so as not to jar the bees, against the hive stand, and examine the frames on each side of it, but with no more success. So I replace all three, and you put on the cushion and cover. Meanwhile I have found a stone, which I put on the alighting board as a mark, and, without as yet making any entry in the register, we pass on to No. 6.

All goes on smoothly till we get to No. 30, which is the same as five. That, and four others, which we come to later, we mark with stones; and, as we are now in the nineties, and there are only a hundred hives in this apiary, we are just congratulating ourselves on not having absolutely lost a single one, when, alas! at No. 95 our pride receives a check. Scarcely have I lifted the corner of the quilt than, without any need of smoke, I see that here we have a case of clear freeze out. Queen dead, bees dead, combs all cold and damp and mouldy. And why? Who can say? Perhaps the hive was diseased the previous summer, but not sufficiently for me at that date to notice anything wrong, perhaps, during the autumn an apprentice took off the cover for something, and left it off while a cold shower soaked the cushion, perhaps there was a leak, and the slow drip, drip of melting snow has been doing its fatal work quietly and insidiously. Put on the cushion and the cover, and close up the entrance with a slip of pine, for we must not chance any other bees coming here to rob, and perhaps spreading disease throughout the apiary. To-morrow we will take the combs and melt them up for wax, clean and disinfect the hive, and then, when it has had a fresh coat of paint, and any small repairs that are necessary have been made, it will be ready, at the proper time, to house another swarm.

The other five hives are all correct; and so we will now return to the six we have marked, and subject each in turn to a rigid search, taking out and minutely examining every frame in the hive, until either we find Her Majesty, or are satisfied that she is dead. In two out of the six we find her. Clearly, however, she cannot be much good if she has not made a start to lay. Perhaps she is too old. If so, it is my own fault, for no beekeeper who knows his business will allow a hive to go into winter quarters with a queen of more than two and a half years. Perhaps she got chilled. Whatever the reason of the slackness we must make the best of her now. So we give the hives some candy, a slab of it being slipped in between the

frames and the quilt, which we can rely on stimulating the bees so that they will make their sovereign do her duty. But these two queens will have a mark against them on the register, which will mean their ruthless execution, on the first occasion when it is convenient to replace them. The other four hives we shall treat by "breaking up." That is to say, we shall return the comb to store, melting up any that

show signs of mould, and shaking out the bees in front of some hive that we have noticed to be weak in population. The actual hives, of course, will be painted and repaired like the former two.

And now we have finished our first inspection. Result: Loss of 5 per cent., which in a big apiary very fairly represents an average year. And now for spring treatment and then the honey harvest.

CHAPTER IV.

THE PRODUCTION OF COMB HONEY.

The whole aim of the bee-keeper, from the opening of spring to the flowering of clover, is to keep his bees brood-rearing. The old stores of last season, the new pollen, and honey too, from willow and elm, fruit bloom and dandelion, and the rest of the spring flora—are not wanted in that shape in the hive at all; what is wanted is that, as fast as it comes in, it should be given wings and legs, be turned into young bees, to labour at the main harvest later on. And to be able to bring about this result without a hitch or a setback is the best test of a good apiarist.

There are two chief methods of forcing the brood-rearing; one, more for amateurs than for men who run things on a big scale, is stimulative feeding; but, even in a big apiary, stimulative feeding is useful at times, as we have seen an example in the case of the two hives whose queens were backward to make a start with laying. The other, in which the professional bee-keeper places his chief reliance, is the judicious spreading of brood. What that means we shall see directly. But, for professional and amateur alike, the best treatment for the first three weeks is, be certain that the bees have stores enough, and—a good letting alone. Why the bees need a letting alone for three weeks is that, as it takes that period for the first generation of the year to begin to show, so, till then, the hive populations not only are old and feeble, and not well fitted to rear brood, (the reader will remember that in the second article I explained that the pap gland tends to atrophy in the old bee), but are decreasing daily; so that to put any extra strain on them would be very bad policy, more likely than not to result in brood being found dead from chill and neglect, and the whole hive becoming diseased as a consequence. And this is just one of those

things that the amateur can never be made to understand. He wants to go too fast.

When on our tour of inspection we noted any hives that seemed short of stores; and these, of course, we supplied, by exchanging an empty frame, or perhaps two, for a frame or frames, full of honey, from some hive having a superabundance; or perhaps we took our full frames from a reserve, kept for the purpose. Then, like wise men, we have been content for twenty-one days to busy ourselves in the work-shop, getting ready sections and crates, making marketing and shipping boxes, etc., etc. But now, the three weeks period being at an end, we are ready to begin to hustle our bees a bit; so once more, reader, we will go round the apiary. I, as before, with the smoker and register, and you ready to take off covers, take any stings which may chance to come with cheerfulness and humility, and generally set an example to other apprentices. At hive No. 1, as before, you lift the cover and the cushion, and I smoke the bees and lift the middle frame. Good; all the brood here are hatched, and a second lot is coming on; so I return it and lift the two frames next to it. Good again; there is a nice batch of maturing brood in each; we will look at the two next. On the front one of these there is nothing, on the other, no, yes, a tiny patch of eggs, and her majesty in the act of adding to them while I hold the frame in my hand. There are plenty of newly hatched bees about, too, not flying yet, but busy for all that, tending the brood. So, fully satisfied that No. 1 will bear spreading a little, I return this frame with the eggs, then, taking out one that the queen has not yet touched, say the third from the front, I re-insert it right in the centre of the hive, pushing the others apart to make room for it. Then I mark the register. No. 1, such and such a date, spread one

frame. When the queen finds this frame, quite empty, right in the centre of her little globe of brood, and consequently in the warmest and best situation for hatching young bees that there is in the whole hive, she feels that she must fill it at once with eggs.

And so we go on with our round, spreading some hives, leaving others for another week, giving stores here and sometimes when the hive looks to be very badly off indeed giving a frame of brood, nearly ready to hatch, from another hive, not so much for their actual numbers, but because one young bee, at this season, will nurse eight or ten grubs, and so the hive will get a filip, and things go on more hopefully. Soon we shall find ourselves going our rounds nearly every day, spreading whenever we can, but not too much, or only disaster will result; feeding, or helping with fresh stores occasionally, and altogether keeping our apiary in good fettle and breeding hard, till, if we have managed well, just about the time of clover blossoming we find every hive strong in vigorous young bees, and with every frame from front to back packed with brood as well. A little honey there may be, just along the tops of the combs, as that is where it is put when brought in and where the nurses go for what they need for the brood; a few cells of pollen, too, may be seen dotted here and there about the combs; but this like the honey is used almost as fast as it is gathered. Practically every hive will at this time be crammed with bees and brood and nothing else. But woe betide the bee-keeper who should now be so foolish as to disregard even three days of continuous bad weather; for with the hive populations living from hand to mouth like this such a panic of starvation would result that the yet immature bees would be dragged from their cells, and their juices sucked, and the whole progress of the hive would be set back a month, and almost all hope of profit for that year would be gone. So he will have either spare combs of stores, or candy, or one of many devices for giving liquid food, always at hand. Nor will he breathe quite freely till clover is fairly open, and his bees at work on it. And this, too, is the proper moment to put on the first crate of sections.

This, as its name implies, is a crate or tray or very shallow box, packed full of the little wooden sections, in which the market requires that our comb-honey should be made; it has no top, and the bottom is only a series of slats, with spaces between through which the bees find passage. Having, as on former occasions, removed cover and cushion and quilt, we place this

crate right on the brood-nest box, where we find that it fits exactly and there are metal catches to hold it in position. The quilt closes it on top and the hive cover is replaced; the cushion we return to store; it will not be wanted again till autumn. We have now given the bees an extra story to their house, and thereby have solved for them what must have been becoming a rather pressing problem, namely, where to put all this wealth of honey that is beginning to come in.

Within half an hour, if we have timed things right, each section (there are 30 sections in the crate) will be occupied by bees, beginning to fill it with comb; and, if we left things go, in a week or ten days at most, they would nearly all be finished. But, to use a colloquialism, the bee-keeper knows a trick worth two of that. So far from leaving them alone to finish the crate, he is, on the contrary, very particular to be on hand when they have no more than half done so, and astonishes the bees by "tiering up." That means that he lifts the half full crate, and interposes another, an empty one, between it and the brood nest. Then, the bees' instinct telling them that a great empty space like that in the middle of their hive must be filled up at any cost—or how could they cross it in winter without freezing to death, they build and work away double time. Of course, long before winter comes, both crates will have been taken by their master and by him converted into cash; but the bees know nothing of that. Whether another tiering up will be possible depends on the season, and more than a little judgment is required to decide. For a while, if bees are allowed to get short of storage room before the end of the clover flow, they will loaf and idle, and honey will be lost; on the other hand, too much room will only result in a lot of unfinished, and unsaleable sections, which is only another way of stating that the beekeeper must know his business.

And that is the way to produce comb-honey. If extracted, or liquid, honey had been our object, the only difference would have been that, instead of crates of sections, we should have superimposed on the brood-nest deeper crates, with frames in them, containing empty comb, built on wired foundation. Then, at the end of the season, or, some of them, before, these would have been put into an extracting machine, and the honey flung out of them by centrifugal force.

And now, reader, as after all you are only making a pretence visit to an apiary, I think that those are lessons enough for you to follow at one time.

CHAPTER V.

ADVICE TO BEGINNERS.

It now remains, in case you should be thinking of doing so, to give you a hint or two on how to start bees yourself.

It is not every one who wants, or who has the time, to make a regular business of apiculture; but I think that any one who lives in the country may find much pleasure and interest in the care of a few hives of bees, and in their produce a quite acceptable addition to the household resources. To a fruit grower the work which the bees do in cross-pollenization of the blossoms would make it worth while to keep them, even if they made no honey at all.

Well, to any one who decides to start apiculture, let me give a word of warning. Do not let him suppose that because he has read the foregoing chapters he knows all about it. Even if apiculture, or anything else, could be really learned from a book, I will be candid and tell him that he knows merely the outlines of the subject. Of course, much more has to be done really. The honey, for instance, has to be taken off and freed of bees without being harmed; which is not so easy as you would think, since the first impulse of a bee when frightened in his hive, is to break through the nearest piece of white capping, and fill himself up with honey. The hives have to be coaxed into proper state for winter. Swarms have to be looked after and artificial swarms have to be made. Disease has to be guarded against continually. Queens have to be reared and superseded. And so on. In fact, volumes might be written, and a good many volumes have been written, on the art of scientific bee culture; and not one of them, still less anything that I can say here, is any use to a beginner without practice. "Experientia docet" holds good, I suppose, in every craft, certainly in none more than that of the bee-keeper. So my advice to any one wishing to start bees is: Buy a couple of stocks in good modern hives and for the first year keep them for comb-honey — it will never pay to buy an extractor for two hives — and beyond hiving the swarms and taking the honey, do as little to them as possible. Of course, you must get a good bee-book to show you how

to do even this, and equally, of course, you will want to do all the other wonderful things that you see described in it. But don't. Be content to go slow at first; then in a few years you will find yourself making artificial swarms, brooding queens, selecting drones, and all the rest of it, with the best of them, and, what is more to the point, making a very comfortable little addition to your income into the bargain. But don't try too many experiments at first.

Sometimes, however, it works out differently. A man with a country house and rural tastes buys some hives, tries to look after them himself, does not take to it, and decides that bees are out of his line. So he turns his attention to other things. Meanwhile the bees perhaps get a sort of half looking after by the gardener, or perhaps get no looking after at all. And so things remain until some fine day one of the enterprising rising generation discovers the forgotten bee-book, absorbs it through a whole wet afternoon, and by night shows all the symptoms of an acute attack of bee-fever. Well, the nucleus of a bee business is already on the estate, and the best thing that the family patriarch can say is "go in my lad and win." After all, viewed from the standpoint of the paterfamilias, bee-keeping is a far better pastime than — than breaking the paternal windows with a catapult, say.

By the way, if a personal reminiscence will be pardoned, it is something in that way that I began my own apicultural experiences. I was eleven years old at the time I made my venture, and without undue boasting, I think I may affirm that a more successful commercial undertaking was never carried through. I will not dwell on the statistics, which were something like this: My father gave me bees, hives and all appliances. I sold him the honey at a shilling a pound and ate it myself afterwards. Cent per cent gives but a feeble idea of my profits in those days. However, there is no need to start the young idea quite so luxuriously as that. On the other hand, do not discourage him; he will meet with quite enough set-backs without your help. It is some of these set-backs and failures, to be expected by every

novice, that I now intend to deal with.

Imprimis, we remember that if there is one person in the world who merits the appellation, apicultural expert, it is the young man who has got hold of a bee-book for the first time and has just read it through. Expert! why that is not the name for him. Principle and practice, he knows it all; he's — well, there is only one word to express his knowledge — he's infallible. The only worse case is that of the young lady in similar circumstances; however, she generally subsides after one good stinging. And now he comes to realities. He gets his hives, and, during clover he learns to manipulate them. In fact, he learns this so easily that he can't do enough of it. He pulls out the frames for every conceivable and inconceivable purpose, but as often as not that his family may see how nicely he does it; till one fine day he finds that the bees are not working on clover any more, and by the time he has been stung all over the face and hands, he thinks he will go and look up the directions for opening hives again. And now let me give him a word of advice. In angry times like these, never open a hive till you have blown two good puffs of smoke in at the entrance with a couple of minutes interval between them — then take off the cover, lift a corner of the quilt, smoke, then the other three corners in succession, smoking a little at each; then quickly and firmly, but quietly peel off the quilt, smudge down the bees, and do what you have to do. A little coal oil squirted amongst the smoker fuel helps considerably.

The next thing that the novice will discover not quite according to book is, in spring a quarter of his bees will be dead. I am afraid that here I cannot comfort him except by saying that wintering with success is a thing that we all have to learn by experience and by experience only. However, if he has the right kind of grit, this failure should only nerve him to greater

care and fresh efforts towards future success. As a preliminary, he should, of course, try to diagnose the cause or causes of the mishap. Perhaps I may with advantage obtrude a few observations as to the basis on which his self-examination should be conducted. First, did he take care to unite all weak colonies early in the autumn? Unless he is very unlike other novices the answer will be, no, he was too anxious to go ahead and have a big apiary quickly. Secondly, did he leave his bees alone during winter? Here again I fear the answer will be no, he went and shook them up about twice a week to make sure they were alive. He probably had the satisfaction of finding that they were so through about three parts of the winter, and then suddenly found that this violent solicitude had been a little more than their constitutions could survive, and that they had succumbed. Thirdly, perhaps most important of all, were his covers really watertight? If not, that explains everything. However, sheet iron, shears, and roofing nails are all cheap, and these with a little paint are all that are required to remedy the matter for next time.

And so having got our beginner through his first winter, not too successfully, but probably quite as successfully as is good for him, let us close with a word of advice to him (which, of course, he will not follow) for the spring. Do not let him give way to the mania for sudden increase. An apiary that is artificially swarmed too much is like a man who has been bled to exhaustion, it is so weak that nothing will succeed with it—at least in the hands of a beginner—certainly next to no honey will be obtained. Even if a profit is tried to be written in by valuing the new stocks at six dollars each; what with all the sugar that will have to be bought to get them into shape for the winter, and the number that will die before spring, a great part even of this will be dissipated.

So my final advice to beginners in apiculture is "go slow and you will go sure."



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